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Fiber Optics to the Home

Fiber optics has helped push the telecommunications system into hyperdrive. But only when fiber connections reach all the way into the home will the technology's promise be fully realized.

By **Jeff Hecht**

It's 2020, and the Gernsbacks have settled into their new home. Dad is watching football on the flat-panel screen in his home theater, but he isn't satisfied with standard broadcasts. The Custom SuperView channel lets him select four current or instant-replay views from any of a dozen high-definition cameras stationed around the stadium. Mom is upstairs working, using telepresence to control a robot cleaning up a toxic waste site in New Jersey. Their teenage son is playing three-dimensional chess with a friend in Paris; a supercomputer in New York calculates the data used to show the pieces on their digital holographic displays. His sister, meanwhile, is practicing with a choir made up of people who live in a dozen cities in North and South America; a computer in Mexico City merges their voices and transmits the music back to their computers in real time, while creating an array of their faces on a single screen.

Some of this technology can be found in well-equipped laboratories today, but not in homes. Today's information superhighway lacks the bandwidth to deliver the required signals, deteriorating into a muddy footpath as it reaches your front yard. Most homes connect to the Net through modems that deliver at most 56,000 bits per second. High-end users are switching to cable modems and digital subscriber lines (DSL) that can carry a few megabits per second. That's a big leap ahead, but hardly enough to satisfy the Gernsback household: The scenario described above would demand 100 to 200 megabits per second.

I named our futuristic family after Hugo Gernsback, a technophile and writer who published America's first science-fiction magazine in 1926. But in just a couple of months, some residents of Palo Alto, Calif., will get a taste of these powers when their homes are wired directly to optical fibers. Palo Alto is not alone on the fiber forefront. Last fall, BellSouth began stringing fiber to up to 400 homes in Dunwoody, Ga., an affluent suburb just north of Atlanta. Unlike other fiber-to-the-home systems that have been rolled out in the past as field trials, Dunwoody is a permanent installation. North of the border, Futureway Communications, a new Canadian phone company seeking a niche offering high-end services, is stringing fiber to homes in five Toronto suburbs. Optical Solutions, a young Minneapolis company, is supplying Futureway with fiber connections for 20,000 homes, and has sold hundreds of home links to other small phone companies.

Competing With Copper

These leading-edge systems are still rare. Most telephone and cable television companies rely on fiber only as a "backbone" technology for piping signals between their own facilities. In fact, fibers are the standard links to and from the switching offices serving each community, and often stretch from there to large business customers or neighborhood distribution nodes. A single pair of fibers now can carry up to hundreds of gigabits per second, with each fiber transmitting separate signals at dozens of wavelengths in one direction. Yet the rest of the distribution network is virtually all copper—that's an investment worth well over \$100 billion and phone and cable companies are not eager to abandon it. Late last year, regional telephone company SBC Communications announced a three-year, \$6 billion fiber construction program in its service area in the western United States.

But conventional wisdom holds that running fiber all the way to a home is too costly, so SBC's

<http://www.google.com/search?q=project+pronto&hl=en&lr=&safe=off&start=130&sa=N>



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fibers will stop at distribution nodes that typically serve hundreds of customers. Data will still slog into the home itself on old-fashioned copper. It's as if a relay team of Olympic-class sprinters had to rely on a geriatric patient for the final leg of the race—known in telecommunications lingo as “the last mile.”

Phone and cable companies each promise a different cure for the World Wide Wait suffered by home users of dialup modems (see table: “[Battle of the Last Mile](#)”). Cable systems deliver up to 36 megabits per second through the same coaxial cable that pipes CNN and HBO to the television set. The phone companies have devised DSL as a ploy to trick ordinary copper wire into behaving as if it were a fatter info-pipe, carrying up to several megabits per second.

People who switch from ordinary Net connections to cable modems typically traverse an arc of experience that begins with delight: The link is always on, just like electricity in a socket, and information flows at speeds that leave dialup modems in the dust. Then the drawbacks become apparent: cable bandwidth is shared among a group of users, so the lightning-fast connections experienced at first start to drag as more of your neighbors sign on. Security is another issue; if file sharing is enabled—a common default setting—everyone on a cable modem line can access your files. DSL has a different problem. The higher signal frequencies that carry DSL's digital data fade as they travel through copper wire, restricting these connections to homes within about five kilometers of cable from a phone switching station. Wireless systems—an emerging high-bandwidth alternative—can suffer blockages from bad weather, trees and buildings.

If the past is any guideline, moreover, demand for bandwidth will soon outstrip the capacity of these jury-rigged alternatives. Already, today's image-intense Web sites crawl when viewed at 56 kilobits/second. Full-motion video, for example, appears as a jerky, low-resolution picture in a corner of the screen. The need for higher capacity into the home is likely to intensify as companies roar ahead with e-commerce. Why show just a static picture and product specifications for a refrigerator if you can have a top salesman deliver a video pitch while demonstrating it on the screen? A reasonable target may be 100 megabits/second, which should enable full-screen, full-motion video and would probably satisfy the Gernsbacks. Then again, satisfaction is a moving target. Bandwidth is a drug; once you're hooked, you only want more. A single optical fiber can easily carry more than 600 megabits/second to individual users—far beyond the capability of either DSL or cable lines. Indeed, DSL and cable modems would whet consumers' appetites by giving them a taste of bandwidth plenty that only fiber can satisfy.

Now is the time to make that investment, at least for new installations, argues Asim Saber, president of Optical Solutions. Saber says that installing fiber will cost an extra 15 percent to 25 percent, but claims that the payoff will come in a few years as bandwidth demand soars. Better, he says, to spend more now than be forced to rip up the sidewalks in 8 or 10 years to add capacity.

Different This Time?

It's not as if no one has tried fibering homes before. Skeptics point to earlier field trials that have failed to find much of a home market for fiber's tremendous bandwidth. Japan's Ministry for International Trade and Industry sponsored the first, which began service to about 150 homes in 1978. The experiment consumed a staggering \$80 million over several years, but—along with similar trials in Canada and France—failed to identify compelling new services that would justify the high cost of installing fiber.

A decade ago, BellSouth and several other U.S. phone companies thought they had found a high-bandwidth activity that consumers would pay for: video on demand. Dozens of homes were fibered in trial systems around the country, but the spark never caught: The level of consumer interest was deemed insufficient to justify the purchase of costly video servers and fiber equipment. Cable companies quickly countered by adding more channels and pay-per-view services to their existing coaxial cables. But a funny thing has happened since the last time fiber was reeled out to domiciles: the Internet. The explosive growth of the World Wide Web has suddenly made millions of people crave bandwidth—a commodity that they scarcely knew existed a few years before.

For the coming decade, fiber-watchers in the United States will want to focus their attention on the southeast. BellSouth—the phone company that serves the region—“is leading the charge in North America” for fibering the home, says Richard Mack, vice president of KMI, a Newport, R.I.-based market research firm. The interest in new technology reflects the rapid growth of its service area. Most new communities want buried utilities, and it is far cheaper to lay extra fibers for future expansion now than to return years later to dig up streets and yards to replace obsolete cables.

Dunwoody residents will continue to receive voice telephone service over existing copper lines, and customers will be offered two new services over fiber. One is DSL-grade data transmission for \$50 to \$60 a month. The second is a video service offering 120 digital and 70 analog channels. Next year, the company expects such fiber systems to become standard for large new subdivisions. By then, customers with fiber connections in their homes could install the equipment themselves. “We don't have to roll a truck at all,” says Dan Spears, research director at BellSouth Science & Technology.

BellSouth admits that the Dunwoody fiber system is costing more to install than copper, but says the goal is to gain experience with the technology. As the cost of fiber to the home comes down, BellSouth “will deploy it in new build situations as we're now deploying fiber to the curb,” says Dave Kettler, vice president of BellSouth Science & Technology.

Scattered groundswells of interest in home fiber connections are appearing in affluent U.S. towns. In Concord, Mass., the Concord Communications Infrastructure Committee, a town advisory panel,

has suggested the town build its own digital fiber network to homes. Cable modems have yet to reach the town, many homes are outside the reach of DSL, and both have limited room for expansion, complains Marc Daigle, an engineer and member of the committee.

Palo Alto's city council has already approved spending \$380,000 to build a fiber network serving nearly 700 homes in an older area near the city center. Residents will get connections at 10 or 100 megabits per second. They will pay about 70 percent of the cost, including monthly charges plus installation fees of \$1,200 or \$2,400, depending on data rate. More than 70 people signed up before the city had set a firm price, says Manuel Topete, who is managing the fiber system for the city's utility department.

The system will offer data transmission at otherwise unobtainable speed. "The trial is all based on Internet delivery," says Michael Eager, a Palo Alto consultant active in the project. "I don't think people would have been significantly interested if we were just talking about 500 channels of television."

Optical Solutions also has found strong interest. The company has sold fiber-to-the-home equipment to a dozen carriers in seven states, says president Asim Saber—plus the order from Futureway in Concorde, Ontario, for hardware to serve 20,000 homes in five Toronto suburbs. Founded in 1994, Optical Solutions accelerated its growth from 13 employees in late 1998 to 65 a year later; Saber expects a head count of 120 by later this spring. Last year Optical Solutions, which is betting its future on fiber to the home, also landed a \$16 million investment in a private placement.

Futureway represents a new but promising market for Optical Solutions—new phone companies competing for business by offering high-end services unavailable from the big established companies. Similar ventures are starting to pop up elsewhere. In December, WideOpenWest of Littleton, Colo., announced plans to build fiber-to-the-curb systems in the Denver and Portland, Ore., areas. Optical Solutions' other customers are independent phone companies seeking to offer broadband services in rural areas. Rye Telephone of Colorado City, Colo., is installing fiber to 500 homes in a sprawling 80-square-kilometer community called Hatchet Ranch. DSL can't handle those distances, and cable companies typically avoid such sprawling areas.

Standardizing Flexibility

For fiber optics to infiltrate a significant number of homes, telephone companies need to settle on technical standards. Just such an effort is under way. Representatives of 20 companies—including British Telecom, BellSouth, France Telecom, Nippon Telegraph and Telephone, GTE and SBC—have teamed to devise a Full Service Access Network (FSAN) running from telephone-company facilities to homes and businesses. FSAN has already been accepted by the International Telecommunications Union and could accelerate the deployment of fiber to the home by providing a set of standards for mass-produced transmission equipment. The FSAN architecture covers a range of fiber uses, from carrying signals to neighborhood nodes and business customers to serving individual homes. FSAN could therefore allow fiber to infiltrate the network piece by piece.

That's important, because fiber is inching its way toward the home. SBC Communications' \$6 billion Project Pronto will bring more than 20,000 kilometers of new fiber cable, extending the optical network to within 2.7 kilometers of most of the homes the company serves. SBC isn't alone; US West is laying fiber to within 1.2 kilometers and Bell Canada to within 900 meters, says Claude Roman, an analyst at market research firm RHK in South San Francisco.

And even before Dunwoody, BellSouth was routinely running fiber down every street in new developments. By the end of last year, the company had installed a hybrid fiber/copper service for half a million homes. Buried fiber cables run to service boxes that sit like fat, square fire hydrants along the curb, and copper wires fan out from each box to several homes. In Dunwoody, the company is "overlaying" fiber—stringing it in parallel with existing copper wires to homes.

FSAN makes this expansion easier with a design called a "passive optical network." The idea is to keep costly and sensitive active components, such as transmitters and receivers, on the ends of the system. Instead of directing signals through intermediate switches, the system simply divides the light among as many as 32 output fibers. No components between the central switch and the end of the fiber require electrical power, helping reduce construction and maintenance costs.

Upgrades to an FSAN system should be easy, generally entailing changes only of the equipment at the ends of the fiber. Data speeds can be boosted by dividing fiber capacity among fewer customers. In the longer term, each fiber might carry one wavelength channel per customer—a technique known as wavelength multiplexing (see "[Wavelength Division Multiplexing](#)," TR March/April 1999).

The companies that developed the FSAN standard—among them Lucent Technologies, NEC and Hewlett-Packard—stress its adaptability. Some already are designing products. "We're developing a system that will provide low-cost fiber access for small to medium business because we think that's where the most obvious prove-in is for fiber all the way to customers," says Ed Harstead, who manages fiber-to-the-home research at Lucent. Indeed, fiber-to-the-business sales will help drive down prices of hardware for more cost-sensitive applications—a key to launching home fiber systems. British Telecom and France Telecom, two of the companies behind the standard, are eager to apply FSAN to business subscribers; BT plans to run fibers to commercial districts, with fibers branching among businesses as they would among homes. Nippon Telegraph and Telephone, which has tested fiber to the home and is cooperating with BellSouth, is now concentrating on

business customers as well. From a technical standpoint, "it's difficult to distinguish fiber to the business from fiber to the home," says Kenji Okada, supervisor of NTT Access Network Service Systems Labs.

Technical standards such as FSAN can't overcome all the hurdles that may impede the fiberization of homes. BellSouth has the advantage of serving a region that is undergoing rapid economic and population growth. That means lots of new housing developments, each one a relatively easy opportunity for fiberization because the ground is already dug up for laying all sorts of power and telecommunications infrastructure. That's not the situation in most of the United States, where installing fiber means new construction. Not to mention the headaches in Europe. BellSouth's Spears says a Telecom Italia colleague was amazed by a photo of a landscape stripped bare by a developer. Spears recalls the Italian told him, "When we go into Rome and start digging in the street, we may run into some artifact, and they put a fence around it and halt construction until archaeologists do their work."

The market for fiber to the home is young, and analysts shy away from forecasting its growth. "It's hard to make projections based on services that don't exist yet," says Jeff Kagan, an industry analyst in Marietta, Ga. In the short term, the biggest question mark is how U.S. consumers and cable operators will respond to digital high-definition television, which will gobble up bandwidth like nothing we have seen so far. In the long term, continued growth of the Internet will push digital demand upward. The static images common on many Web pages load slowly at 56,000 bits/second, driving demand for DSL and cable modems in the megabits/second range. As increasing numbers of Web-site designers yield to the temptation to display moving images, even these lightning-like hookups may begin to feel sluggish.

Extrapolating the 20-fold growth in bandwidth of the 1990s—modems jumped from 2,400 to 56,000 bits/second—leads to a projection that by 2020, 100 megabits/second will be routine. And that may be conservative. Adel Saleh, chief network architect at Corvus in Columbia, Md., says that 100 megabits/second could come to homes as soon as 2005. Saleh predicts that by 2010, wavelength multiplexed systems will provide bandwidth on the order of 1,000 megabits/second. With that kind of capacity, the biggest problem will be figuring out how to tap into our inner Gernsback.

Jeff Hecht is a correspondent for New Scientist and author of several books about lasers and fiber optics. His latest book is City of Light: The Story of Fiber Optics, published last spring by Oxford University Press as part of the Alfred P. Sloan Foundation's Sloan Technology Series.

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- [News about the Palo Alto, Calif., fiber-to-the-home trial](#)
- [Optical Solutions](#), a company staking its future on fiber-to-the-home
- [Fiber Optics Online](#), a "virtual community" for the fiber optics industry, with news and product information
- [Project Pronto](#), a \$6-billion effort by SBC Communications to bring fiber to the neighborhood, if not to individual homes
- [An introduction to the FSAN standard](#) from the European Institute for Research and Strategic Studies in Telecommunications
- [RHK](#), a market research firm specializing in fiber optics.
- [DSL Tutorial](#)—information about Digital Subscriber Line technology, including a "Bandwidth Simulator".
- [DSL Forum](#), additional information about DSL from an association of companies that provide DSL-related products and services.
- [A Short History of Fiber Optics](#), a chapter from the book *Fiber Optics Technician's Handbook* by Jim Hayes (Delmar Publishers)
- [KMI Corporation](#), a fiber optics and telecommunications market research company
- [Lightwave Magazine](#), a publication serving fiber-optic communications technology and applications
- [Light Reading](#), an online publication covering optical networking.

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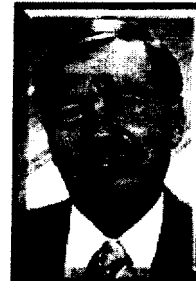
NETWORK CROSSROADS/Tom Nolle

The Shape of the DeMarc to Come

from the February 2000 issue of Business Communications Review, pp. 10-12

by [Tom Nolle](#), president of CIMI Corp., a consulting firm that specializes in advanced computer and communications networks. He is also a member of the BCR Board of Contributors.

The local exchange carrier's access network is the most fundamental element in our relationship with carrier services. The technology and protocol that the access network supports determines the basic features of access devices, which perform a critical job: to link network services to each enterprise. Moreover, the services that each individual obtains also are drawn through this network, and so its features affect all of us—collectively and individually.



Now guess what? The access network is about to undergo its most dramatic change ever. The SBC announcement of its broadband initiative, dubbed Project Pronto, may turn out to be a blueprint for 21st century LEC infrastructures, even though each incumbent will have to account for quirks and kinks that reflect local conditions, practices and problems. But the bottom line is that Project Pronto offers the chance to examine how the future access network will affect us and our service decisions.

ATM Foundation For Project Pronto

Project Pronto will replace SBC's TDM-based network with one based on ATM. The new network will be heavily dependent on broadband, fiber-based remote terminals that SBC calls "neighborhood gateways." These gateways will perform concentration and traffic steering functions, and work in conjunction with ATM switches located in the COs. It looks like SBC intends to provide voice services via ATM circuit emulation, with fiber remotes converting the analog voice loop connections to constant bit-rate permanent virtual circuits (ATM CBR PVCs) or, eventually, switched virtual circuits (SVCs). Data services will be offered through one or more ATM virtual circuits, that will link the customer demarc with a data service point of presence (DSPOP).

This new structure will have not only a major impact on carrier equipment procurement, it will also affect decisions about devices for the premises as well as user services. For some, it may even resuscitate premises-based ATM.

Project Pronto's ATM infrastructure could deliver any form of voice or data service, as long as equipment on customer premises—whether owned or leased—is available to create the correct interface. Frame relay, IP, T1 voice and even CBR leased lines all will be available, and vendors are already offering integrated access devices to provide the needed physical interfaces for each. In many cases, users will have multiple carriers to provide their mix of services, and in most cases at least some services offered over the access network will be provided by someone other than the ILEC—any ISP or frame relay provider, or new carriers that may emerge.

The concept of a multiservice demarc isn't new, but few users have much experience with multijurisdictional demarcs. In today's TDM-dominated networks, IXCs usually acquire the access line from the ILEC and sell it to the end user along with the services. The IXC also provides management surveillance into and through the ILEC network, giving the user a single point of contact for both procurement and support.

A Management Quagmire?

But it's not at all clear that this familiar arrangement will be possible in the future; the shared access line changes everything, including a blurring of responsibilities. A single, integrated termination could be used by several service providers, all delivering service to the same customer via a single demarc device. If something goes wrong, finger-pointing will be taken to an altogether new plateau. While customers use multiple carriers today, the carriers don't collectively manage a single connection; instead, each IXC delivers service via a dedicated access line.

So the first impact of this new form of integrated access will be for customers to separate management of the access network from management of network services. The ATM management facilities exposed by SBC's new network will be the key to access management, but it's too early to know what those facilities will be. Users should scrutinize service management details closely when new offerings are announced.

In fact, it's logical to assume that each service offered over the new access network could require independent management. That, in turn, raises the question of whether the demarc device, where all services enter the premises, should contain the primary management agent for the user or, whether service management should be delegated to a service-specific device that attaches to the demarc device—to, for example, a router.

On the one hand, it makes sense to delegate service management to a device that can actually perform the necessary tasks, but there's a downside: This removes the metering of customer service data away from the demarc, which in turn opens up the likelihood of finger-pointing when problems occur.

Another important question is whether services are to be delivered on independent virtual circuits or combined on a single circuit. Pricing policy will obviously weigh heavily on this issue; if ILECs price ATM access the way most IXCs price frame relay, there'll be an economic incentive to aggregate services from a single provider onto a single virtual circuit (VC). Arguing against this would be the problems with control of quality of service (QOS) that might arise if the services must respond to multiple sets of QOS requirements or business priorities.

The question of access via aggregated service versus access via per-service virtual circuit also affects CPE requirements. If all services are delivered on a common pipe, the access device will have to provide fairly sophisticated class-based queuing to prevent interference among the various information flows. On the other hand, if each service has its own virtual circuit, the standard ATM QOS management probably will suffice.

But service segregation onto independent VCs also could mean services must be separated through access policy rules in the demarc device. And here again is a problem: Since most users probably won't have separate physical interfaces on their demarc device for each data service, how will rules be created and communicated, particularly if the demarc device is CLE—i.e., leased/bundled into the service by the carrier?

An SLA By Any Other Name

Then there's the issue of service level agreements (SLAs). How will SLAs be developed when the access network introduces traffic multiplexing that could, theoretically, generate delays and loss of information? Would a service provider take responsibility for a service if the access network could contaminate QOS?

Would the provider have to work with the customer to set network service parameters for access to ensure compatibility with the overall SLA? Again, it would seem essential that the management system or strategy distinguish between network access issues and network service issues, or else the user will be clueless when seeking a remedy for problems with end-to-end applications.

Further SLA problems may arise because ATM service specifications for peak and average throughput, delay and discard rate don't map well to the service parameter sets of other protocols. So, there can be trouble if, for example, a customer's "virtual demarc"—i.e., the port on the carrier-provided access device to which the customer connects equipment—is IP and the carrier's access network is ATM.

Ironically, this may result in revitalizing ATM within the premises. Some users will want to extend the multiservice access network they buy from the ILEC into their premises, which could encourage users with a wide variety of services to deploy ATM on the premises; to create, a hybrid public/private ATM network. In effect, large users may build "ATM VPNs."

Private ATM virtual networks haven't received much attention, but ATM virtual circuits from a private network could be "tunneled" through public ATM services; indeed, some ATM products, for example the Lucent 9000 (from Cascade/Ascend) have long supported that approach. The MPLS standard could also be used to create "nested" private IP/MPLS networks over public, private or hybrid ATM networks. Unfortunately, there isn't much practical experience with any of these concepts, so users will have to take care.

Conclusion

There are several reasons why the extension of ATM services across the demarc and onto the LAN isn't likely to reach the desktop. First, data-oriented alternatives to ATM, like MPLS, would offer the same level of QOS control as ATM, and in a way that is more compatible with IP equipment and management practices.

Second, IP awareness in the LAN is confined to routers and to switches that operate at Layer 3 or higher; by definition, those are at the top of the LAN switching pyramid, away from the user. These high-level devices might be affected by ATM delivery of carrier data services, particularly if they have direct WAN interfaces.

There is a good chance that the new broadband access network will reshape premises device requirements. It is virtually certain to affect access and service management systems and policies. To the extent that carriers differentiate themselves through their ability to deliver application-specific QOS, the impact of the new access network will extend into premises networks at least as far as policy management databases and devices involved in traffic classification.

This is a good time to begin developing a preliminary plan, and here are some key initial steps:

1. Find out when your sites will be affected by the ILEC broadband initiative.
2. Find out what service interfaces will be offered.
3. Find out whether your equipment vendors support those interfaces.
4. Find out whether your management system can cope with multiple carrier service MIB sets or service objects. Test the combination thoroughly when the first site becomes broadband equipped, and then develop an operational plan to use on subsequent sites.

According to SBC, broadband access will be virtually universal by 2003, and some areas will see the impact by early next year. Enterprise policies, equipment and provider relationships must keep pace with the developments. As of today, however, few users could say that they're ready.

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Kagan - Cable TV Over Phone Lines Coming

By Jeff Kagan, Newsbytes
ATLANTA, GEORGIA, U.S.A.,
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COMMENTARY. Phone companies and cable television companies are in the transformational race of their lives, investing billions of dollars rewiring America as they rush to upgrade their networks to handle a complete bundle of services that customers are supposedly going to be demanding.

But who has the edge... cable companies or phone companies?

Historically, telephone companies enjoy a better relationship with customers than cable companies. Let's face it, phone service has a better reputation for quality and reliability than cable does. After all, we grumble a bit when cable TV goes out for a few hours now and then, but we'd throw a fit if that happened with our phone service. That's because in the past phone service has been considered a necessary and vital link to the outside world and cable television service has been considered more of an entertainment service.

All that is changing as cable companies are rushing to upgrade their networks to offer a complete bundle of communications, information and entertainment services.

Cable television companies like AT&T (TCI and Media One), Time Warner, Comcast and Cox are upgrade their systems to be able to handle local and long distance voice calls (cable telephony) as well as Internet access over one line.

Seems like a no-brainer doesn't it? After all voice requires so little bandwidth they should be able to easily pump little, bitty, voice signals over the big, fat, cable TV pipes that typically carry hundreds of television channels. That's the theory. And in the markets where it's available the product is actually pretty good.

Cox in particular has a reputation for delivering an excellent quality product. But then again, they historically had a great reputation for delivering plain old cable service, or POCS. Should we coin a new acronym? Why not. You can never be too rich, too thin, or have too many acronyms.

In comparison, networks like Time Warner and AT&T (which used to be TCI) have grown through acquisitions over the years. This patchwork quilt of different cable systems is a bigger job to stitch together into a seamless network that delivers uniform quality from sea to shining sea.

It's do-able... but it's just a bigger job to pull it off.

Last year AT&T flew me in to see their Digital Living Room. That's their demo room for their future broadband offerings. A taste of where AT&T is heading with all of these cable acquisitions and upgrades. Phone service and high speed internet access as well as POCS over those cable lines. The demo room had excellent quality and was impressive, but was exactly what I expected to see. No surprises. It's just a matter of time waiting for them to upgrade their massive sprawling networks.

But what about the phone companies? SBC, US West, BellSouth, Bell Atlantic are the local phone companies and already do business with most of the customers in the USA. That's a powerful asset to leverage. But how are they going to compete against the cable companies everything-over-one-line bundles?

Ameritech offers cable television service over cable lines and BellSouth Entertainment offers wireless cable television (which by the way I have been using for the last year or so and is excellent product). They both have been successful in offering a welcomed choice in cable service to the markets they serve.

While these cable offerings are going to become an important part of the mix for these companies, cable service from phone companies is about to take an entirely new twist.

A few weeks ago US West flew me out to tour their VDSL project in Phoenix.

In short... it took by breath away! I couldn't believe my eyes.

I saw them deliver hundreds of channels of high quality digital cable television and pay per view services, high-speed internet access and regular phone service... all over regular, existing, copper phone lines that are already there.

We all know about voice over cable... or cable telephony.... But this was the reverse... cable over phone lines... and it was amazing. The only problem is there is not catch phrase for it yet. How about "cablephony?" Ok fine. If you think its so easy, you give it a shot!

Whatever we end up calling it, it's pretty darn amazing.

VDSL is going to be one of the silver bullets for the local phone companies as they transform.

This makes so much sense that I can imagine US West expanding this VDSL beyond Phoenix to their whole region.

SBC through their Project Pronto is positioning themselves to deliver these same kinds of services to their region.

BellSouth and Bell Atlantic haven't talked publicly about VDSL much, but I think it's safe to say they are also looking at these kinds of services in order to remain competitive as the marketplace changes and customers are going to be looking for all-in-one solutions. I know Bellsouth is being very aggressive in driving fiber deeper into the neighborhoods because they just dug up my lawn and everyone in my neighborhood to do it and this is being repeated all over their region.

One caveat... as exciting as all this is, it's just the beginning of this part of the revolution. Most customers don't have access to ADSL, let alone VDSL yet. But the nations phone companies are rushing as fast as they can to remedy that. For instance, SBC is rolling out DSL to most of their region by year end through Project Pronto. That's an extremely aggressive plan.

It takes time and money because offering VDSL requires the local phone companies to drive fiber deeper into the neighborhoods. The customer has to be within 4,000 feet of the interface. So they still have a lot of work to do.

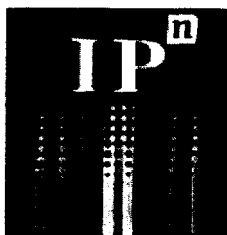
Bottom line; you might not be able to pick up the phone today and order these all-in-one bundles from your local phone company or your cable company yet... but stay tuned.

Revolutions take time... but they are usually worth the wait.

Jeffrey Kagan is an Atlanta-based telecom industry analyst, commentator, and self-described provocateur. He is a frequent speaker at industry conferences and corporate meetings and author of 'Winning Communications Strategies' (Aegis Publishing). He can be reached at jeff@jeffkagan.com or on the web at <http://www.jeffkagan.com>

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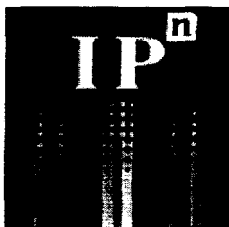
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January 13, 2000
InternetNews - ISP News ArchivesProject Pronto At Heart of SBC Revenue Plans
By Patricia Fusco

e-mail article

SBC Communications Inc. wants to more than double its revenue growth rate over the next three years and sees broadband going a long way to making that happen.

Edward E. Whitacre Jr., (SBC) chairman and chief executive officer, said SBC expects 75 percent of its revenue growth to come from its "Project Pronto" broadband service deployment, wireless and long-distance calling services.

"We firmly believe that SBC has assembled the best portfolio of growth assets in our industry," Whitacre said. "And we're beginning to see the benefits of SBC's transformation into a global growth company."

According to Whitacre, the company is ahead of schedule in deploying Project Pronto, its next-generation Internet broadband network. SBC launched the \$6 billion initiative in October as part of an effort to utilize resources gained from Ameritech acquisition.

On Monday, SBC filed with the Federal Communications Commission to move into the long-distance business in Texas. In December, the company's application received unanimous endorsement from the Texas Public Utilities Commission. The company expects FCC approval by April and plans to request adding long-distance services in additional states yet this year.

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Posted: 1/15/00

New, Old Carriers Place Big Bets on ATM Switching

By Peter Lambert

Is broadband, integrated access changing carrier services and operations so much that an incumbent telephone company would replace its reliable, hundred-year-old switching infrastructure, or would a new competitive carrier take a leap of faith to deploy a relatively unproven, new class of switches made by manufacturers with names unheard of among a savvy customer pool? Is broadband, integrated access changing carrier services and operations so much that an incumbent telephone company would replace its reliable, hundred-year-old switching infrastructure, or would a new competitive carrier take a leap of faith to deploy a relatively unproven, new class of switches made by manufacturers with names unheard of among a savvy customer pool?

Over the past several months, a number of real-world service providers in North America have begun to do just this. They are driven in great part by the emergence of integrated access devices (IADs) and broadband, digital subscriber line (DSL) access equipment—technologies that promise to alter the economics of both long distance and local telephony and to make resale and arbitrage of the advanced broadband and integrated access services a difficult proposition.

IADs and broadband access appear to be accelerating the urgency to migrate from circuit-switched networks to packet-switched networks that can support toll-quality voice. To these pioneer carriers, that means ATM packet switching. Since the driving forces behind their ATM strategies—particularly IADs and DSL—are proliferating worldwide, many carriers outside North America are likely to follow suit.

Among the U.S. pioneers, Bell operating company (BOC) SBC Communications Inc. (www.sbc.com), in the closing weeks of 1999, committed US\$6 billion to a radical overhaul of its infrastructure. Among DSL leaders worldwide with more than 100,000 lines, SBC is determined to make DSL available to 80 percent of its customers and, concurrently over the next several years, to scrap its entire circuit-switched, tandem trunking network in favor of voice trunking over ATM (VToA).

SBC's \$6-billion Project Pronto "represents the kind of fundamental change that only comes every 60 years," says Sam Sigarto, executive director, ATM distribution network systems, broadband switching for SBC.

Yet, at the same time, Global NAPs Inc. (www.globalnaps.com), a relatively new U.S. backbone carrier with a much shorter history, also committed late in 1999 to migrating all its traffic to VToA. In another case, U.S.-based next-generation CLEC 2nd Century Communications Inc. (www.2c2.com) began to bring IADs and ATM telephony to customer doorsteps in the local loop. Further, the link between broadband access and packet-service integration can extend beyond DSL. In Los Angeles, AirPower Communications Inc. (www.airpower.net), an emerging wireless broadband, local multipoint distribution service (LMDS) carrier, also is breaking with convention and experimenting with

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integrating all its services over new Dynamic Transfer Mode (DTM) switching, a wholly new packet-transport technology from Dynarc Inc. (www.dynarc.com).

The links among DSL deployments, local integrated access services and ATM switching may be most evident in SBC's Project Pronto. For the asymmetric DSL (ADSL) data services already deployed in SBC's local loops, the transport technology is already ATM. Although Sigarto says "the jury is still out" on whether DSL voice traffic also will travel over ATM virtual circuits (VCs) in the local loop, both voice and data certainly will travel over ATM transport in SBC's backbones.

Because ATM has statistical multiplexing capability--that is, the ability to have multiple services dynamically share the same bandwidth--the new ATM backbone promises to raise SBC's trunking bandwidth utilization from about 60 percent to approximately 90 percent, part of the reason the carrier expects the new infrastructure will generate US\$1.5 billion in capital and operating expenses annually, Sigarto says. "You can leverage statistical multiplexing to gain efficiency transporting bursty data traffic as well, but voice alone looks like it could pay for the investment in ATM trunking."

"The opportunity to gain these kinds of savings and flexible service capabilities is worldwide," says Claude Romans, director of loop access for industry analyst Ryan Hankin Kent (www.rhk.com).

Indeed, SBC is not alone in deploying DSL systems for integrated voice and data around the world. According to Paris-based Alcatel (www.alcatel.com), although SBC, BellSouth Corp. (www.bellsouth.com) and other U.S. carriers accounted for about 80 percent of Alcatel's 1 million ADSL lines shipped by last November, the rapidly growing Asia-Pacific market accounted for 15 percent of the Alcatel ADSL lines shipped in 1999, while Europe, where ADSL deployments are just now getting underway, contributed 5 percent. Alcatel customers outside North America now include Bell Canada (www.bell.ca), Belgacom (www.belacom.be), British Telecom plc (BT, www.bt.com), France Telecom (www.francetelecom.fr), P.T. Telkom of Indonesia, Singapore Telecom International (www.singtel.com), Telefonica in Spain (www.telefonica.es), Telecom Italia (www.telecomitalia.it) and Telia in Sweden (www.telia.se).

As with SBC, Global NAPs' selection of ATM for integrated services transport was driven by capital and operational cost savings. Specializing in providing bulk lines to ISPs including Microsoft Corp.'s MSN (www.microsoft.com) and Mindspring Inc. (www.mindspring.net), Global NAPs expects to kill two birds with one stone in the form of a US\$50-million deal to buy 75 Integrated Convergence Switches (ICSs) from Convergent Networks Inc. (www.convergentnet.com).

First, the Convergent ICS can lower costs per DS-0 voice circuit from the US\$200-US\$300 range to US\$25, "so I'm effectively going to cover 10 times more new markets than I could with more [Nortel Networks] DMS 500 [Class 4 circuit] switches"--a boon to the company's plans to expand its national presence to 85 percent of U.S. markets in the next two years, says Global NAPs' CEO Frank Gangi.

Second, Convergent managed to carry live traffic within four hours after bringing its switch to Global NAPs' Boston office, while Nortel (www.nortelnetworks.com) could not claim the same for its DMS 500 after two months, Gangi says. "That shrinks my time to market from forever to basically zero."

At the same time, he adds, "the Convergent switch is a Swiss army knife that can help us migrate our entire network to ATM while also talking to any other network, whether IP or ATM or the public switched telephone network."

For both Global NAPs and SBC, integrating services onto one backbone with one, common transport infrastructure has become the most economic path.

"Is ATM optimized for voice?" asks SBC's Sigarto. "No, nor is it optimized for IP alone or video alone, but we need to build not six optimized networks for six separate services at six times the cost,

but one network that can accommodate all those services, and ATM gives us the capability now to build that one network, and it may cost us 1 1/2 times what a single-service network would."

Match This

These changes in network fundamentals may raise the stakes for all carriers. In the United States, RBOCs in particular can call the technology tune, as they still provision well over 90 percent of all access lines, notes Tom Nolle, president of telecommunications consulting firm CIMI Corp. (www.cimicorp.com) Where new players Global NAPs and 2nd Century have committed US\$50 million and US\$30 million, respectively, SBC will spend US\$6 billion over the next several years. Other RBOCs have vowed to commit equally impressive war chests to transforming their networks to packet transport.



Graph: ATM Rides Last-Mile Integrated Access Wave

In short, the type of technology with which powerful U.S. RBOCs provision the preponderance of local lines—with ATM switches, IADs, and DSL access multiplexers (DSLAMs), for example—matters, in part because their volume purchases of equipment like ADSL modems drive international standards. Further, other carriers must compete with the incumbents' networks, in some cases unbundling incumbent equipment and systems for resale.

"It's well established that investment in packet technology can lower the costs of networking," Nolle says, "but that's meaningless if the savings gained can be wiped out by reseller arbitrage."

U.S. incumbents such as SBC gained relief from having to unbundle and wholesale packet services last September when the U.S. Federal Communications Commission (FCC, www.fcc.gov) issued a new unbundled network element (UNE) list—those pieces of the incumbent's networks that must be made available to competitors. Incumbent phone companies must continue to provide local loop access and other basic network elements, but they aren't required to offer competitors access to new high-speed data networking systems.

"By not requiring incumbent carriers to unbundle DSL equipment, the FCC recognizes the importance of facilities-based competitors," Steven Gorosh, general counsel of national, facilities-based DSL competitor NorthPoint Communications Inc. (www.northpointcom.com), said at the time. The decision, he added, will prompt further investment in facilities-based DSL deployment by both incumbents and competitors.

According to SBC's Sigarto, that ruling did play a small strategic role in SBC's decision to commit to its broadband network rebuild. "It was certainly one of the key attributes, but only one among others," he says.

Yet even if the RBOCs eventually must unbundle their broadband network and service elements, Nolle says, ATM's elegant, dynamic bandwidth provisioning capabilities enable a facilities-based carrier to create services that are customized for each end user. The more customization, the more difficult for resellers to replicate without ATM facilities of their own.

Certainly, some new competitors are taking that facilities investment challenge. For example, while Global NAPs applies ATM to bulk line wholesale in its backbone, 2nd Century and Gabriel Communications Inc. (www.gabrielcom.net) are determined to effectively overbuild phone companies' circuit-switched local loops with integrated access networks based on ATM packet transport.

Sporting its own US\$30-million contract with Convergent Networks, 2nd Century successfully completed interconnect testing last summer, carrying voice traffic between 2nd Century's ATM-based local exchange network and incumbent GTE Corp.'s (www.gte.com) facilities in Tampa, Fla., United States, all under

the control of standard signaling system 7 (SS7). For its first local ATM telephone transmission, 2nd Century used Convergent's ICS in conjunction with VINA Technology Inc.'s (www.vina-tech.com) Multiservice Xchange (IAD) to encapsulate in ATM cells all voice, data and video at the customer site; then Advanced Switching Communications' (www.asc1.com) RBOX Multi-Service Aggregator aggregated traffic from those IADs, passing it to the ICS switch.

VINA, Accelerated Networks Inc. (www.acceleratednetworks.com), Sonoma Systems Inc. (www.sonoma-systems.com), Vertical Networks Inc. (www.getvertical.com) and other manufacturers believe the United States represents only the beginning for IADs. Last March, for example, VINA opened offices in Hong Kong and Reading, United Kingdom, to provide sales, marketing and technical support to customers and partners in Europe, the Middle East, Africa and Asia Pacific. Since last May, Berlin-based telecommunications equipment supplier DeTeWe (www.deteuwe.de) has been licensing and manufacturing Vertical Networks' integrated access systems for 17 European countries.

Although PTTs in Europe and Asia generally have not yet been forced to unbundle their local loops to competitors to the same extent as in the United States, RHK's Romans believes that competing carriers will begin to implement models wherein the end customer pays the PTT for DSL access but comes to the competitor for IADs and integrated services including VoDSL. "That is a viable model where you can't get direct access to the copper," he says, adding that such models will force the PTTs toward infrastructure overhauls like SBC's Project Pronto to make sure that competitors don't steal away the richest premium revenue opportunities.

If ATM promises to deliver voice quality, other technologies also must be applied to bring the feature-richness of integrated packet telephony services into parity with the legacy PSTN. Toward that end, ATM-based IAD makers are developing ways to deliver local calling features via IADs. Convergent, Sonoma and half a dozen IAD vendors have agreed to use the International Telecommunications Union's (ITU, www.itu.int) Q.2931 call control signaling standard and to implement Q.2931-to-SS7 interworking, enabling the translation of PSTN local call features to any local ATM system.

TeraBridge Technologies Corp. (www.terabridge.com) has launched an interoperability laboratory to prototype complex network signaling environments for vendors and carriers participating in the ATM Local Telephony Alliance (www.altainfo.org). Last summer, TeraBridge demonstrated an international voice call traveling from France to the United States using only ATM transport and TeraBridge's PathMinder software suite for call control session management.

"Call control is now decoupled from transport," says Seng Poh, vice president of technology and business development for Convergent. "So now you can define new features, program them on open softswitch servers, and have them run across any network that can be signaled."

Provisioning in Play

The emergence of DSL and other broadband access technologies, combined with packet telephony technologies and customer requirements for delay-free voice services, make DSL and ATM natural bedfellows, according to ATM advocates, who note that many DSL systems already are driving ATM down to the customer premises.

Pitching ATM as the best quality assurance for packet voice over DSL (VoDSL) traffic, IAD makers are adding DSL interfaces and partnering with VoDSL gateway makers. "Service providers are saying they want to reduce costs but not at the expense of the customer's experience," says Matt Howard, vice president of marketing for Vertical Networks, which has partnered with several VoDSL gateway makers. "We expect it will be 18 months before a customer could go completely IP in the last mile."

Heidi Brandt, vice president of corporate marketing for Sonoma Systems, which like Vertical Networks has integrated PBX

capabilities in its Sonoma Xchange IAD, agrees. "We just don't see service providers carrying IP services that require QoS except over ATM."

Indeed, according to industry researcher Cahners In-Stat Group (www.instat.com), IP telephony-based services are the key driver behind a rise in ATM investments by ISPs. Sales of wide-area ATM switches to service providers saw growth of 25 percent during the second quarter of 1999, growing from US\$441 million to US\$554 million--following only 3 percent growth in the first quarter of the year. Laurie Gooding, senior analyst with Cahners In-Stat, predicted ATM switching and voice over IP (VoIP) gateways would see parallel growth throughout 1999.

Whether it travels as VoIP over DSL or as VoIP over ATM over DSL, new VoDSL that supplies up to 16 voice circuits per customer "will increase the need to connect with a switch that can talk with the PSTN, and that can either be a US\$5-million Class 5 switch or a US\$500,000 next-generation, class-independent switch like ours," says Dan Simpkins, president and CEO for Salix Technologies Inc. (www.salix.com), maker of class-independent switches that constitute large-scale voice-over-any-transport gateways.

And whatever the underlying transport, integrated voice and data access requires the ability to route multiple services over a single pipe and to provision bandwidth, encryption, firewall, filtering and any number of other network resources on a per session basis.

"The urgent need for dynamic, rapid provisioning systems is in the metropolitan area, where broadband access will push capacity requirements from kilobits to megabits per user," says Olov Schagerlund, CEO for Dynarc, whose DTM switches provide a "thin layer" between optical and IP networks for transport of integrated services. "You must have a transport layer that makes it easy to provision new services, because service providers will need to launch and relaunch new services, experimenting to find the killer application."

2nd Century, Gabriel Communications, Global NAPs and SBC, as well as Sprint Corp. (www.sprint.com), with its Integrated On-Demand Network (ION), all have decided that ATM provides that dynamic provisioning, as well as fail-safe traffic engineering and QoS guarantees on a per-connection basis.

However, IP advocates such as backbone Terabit Switch Router-maker Avici Systems Inc. (www.avici.com), argue that routers are the logical nexus for packet service provisioning. "We believe the dynamic provisioning solution lies ultimately with intelligent routing directly into optical wavelengths or via optical cross-connects, because the router is the device with visibility into the data stream," says Pete Chadwick, vice president of product marketing for Avici.

Still emerging from the Internet Engineering Task Force (IETF, www.ietf.org) and in product development among both router and switch makers, a multiprotocol label switching (MPLS) standard proposes to enable ATM-like VCs between points on IP networks. "There's a lot of interest in learning to do traffic engineering via MPLS, and to have that interwork with optical provisioning systems," Chadwick says. "One service provider tells us it expects to have terabit routing at its edge and all optical switching of huge capacity in its core, so there are a range of visions in play."

For the first time in service-provider local loop history, ATM has become the lens for one of those visions.

Peter Lambert is features editor for PHONE+ International.

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What's News

SBC Starts Building Network Pronto

By Brandy Pfalmer

SBC Communications Inc. (www.sbc.com) has taken the first step to put its plan, "Project Pronto," in motion by selecting vendors for the \$6 billion initiative to build a converged network.

Among those selected are Advanced Fibre Communications Inc. (www.afc.com), Alcatel (www.alcatel.com), Lucent Technologies Inc. (www.lucent.com), Newbridge Networks Corp. (www.newbridge.com), Nortel Networks (www.nortelnetworks.com) and Siecor Corp. (www.siecor.com).

SBC will deploy Lucent's 7R/E Packet Solution to move traffic over the new network structure via voice trunking over ATM, which will move the traffic that flows between COs over ATM networks through packets. This end-to-end tandem product provides a solution for the heavy traffic in the interoffice portion of the network.

7R/E will be installed in the Los Angeles area by April 1. Company officials expect the network to go live shortly after equipment is deployed.

Neither company has made a statement concerning the amount or cost of the Lucent equipment, says Diane Herr, vice president of 7R/E product management and marketing at Lucent. Once the network is up and running, SBC may decide to make additional purchases.

Details on the contract terms or deployment plans for other vendors' equipment were not disclosed.

Project Pronto is designed to meet the growing demands of SBC's customers for high-speed data services. DSL services currently are limited to customers that reside within 3.5 miles of a CO. Through this project, SBC intends to make DSL available to 80 percent of its customers by continuing to place DSL access multiplexers in COs and broadband gateways and fiber optic facilities.

Additionally ATM-based equipment will be used to integrate the voice and data backbone networks to transport voice via packets. The company has not announced that may happen.

Hot News

11/08/2000

Sonus, Convergent Earn Next-Generation Network Contracts

On the heels of its acquisition of telecom technologies Inc. last week, Sonus Networks Inc. announced a contract with XO Communications Inc., formerly NEXTLINK Communications Inc., for between \$15 million and \$30 million in next-generation network equipment.

11/07/2000

TalkingNets Launches IP-Based Network

TalkingNets today opened the doors for ISPs and data CLECs hungry for a piece of the voice market with its launch of an IP-based network built around softswitch and SIP technologies. First to get the new services are Cleveland and Denver, with another 23 cities to follow shortly.

11/06/2000

ECI Telecom Enhances IP Telephony Service with MIND CTI Billing and Customer Care

ECI Telecom Ltd. and MIND CTI Ltd. announced today that the companies would integrate platforms to enable interactive billing and customer care for ECI's IP telephony offerings.

11/03/2000

Equant to Link Coca-Cola in 87 Countries

Coca-Cola is setting its sights once again on the "real thing." This time, however, the real thing is a \$47 million global

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communications network to link the beverage company's employees at 289 sites spanning 250 cities and 87 countries.

VoiceGenie Lights Fire Under VoiceXML Developers

VoiceGenie is turning up the heat in its bid to saturate the voice web access market with VoiceXML applications by offering \$10,000 to the best VoiceXML application.

More Hot News



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Defining the Future of Web-Powered Communications	IDC's Web Talk Forum December 5-6 Santa Clara, California
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I make myself as valuable to our clients as they are to me...

- **Competitive Analysis.** SBC closely monitored competitors' deployment and communications activities. Competitive analysis revealed that in California - considered ground zero in the broadband battle - SBC's DSL availability exceeded cable modem availability by a 2-to-1 margin. With the debate over which technology would prevail largely centered on availability, the information proved invaluable in changing opinions. SBC also used competitive intelligence to launch in major Texas markets before competing providers.
- **Third-Party Surveys/Research.** Independent surveys and reports were monitored and used to validate SBC's internal research to reporters and analysts. Key reports include a November 1998 Yankee Group study that found four out of five consumers preferred to receive broadband service from their telephone company instead of their cable company; a study released in May 1999 by Keynote Systems, an Internet consulting firm, which found that SBC's DSL service outperformed cable modems during peak Internet traffic hours; and industry forecasts that predicted DSL's subscriber base would eventually eclipse cable's.
- **Industry Analyst/Media Research.** Exhaustive research of media coverage and industry analyst reports was done to determine perceptions and knowledge of broadband issues.
- **User Groups.** SBC monitored user groups to assess customer satisfaction levels with SBC and its competitors.

Planning

Objectives:

- Convince key influencers that SBC's superior technology, aggressive deployment and powerful distribution channels positioned it for success within the broadband industry.
- Position DSL as the broadband service of choice for consumers and businesses.
- Establish SBC as the nation's leading DSL provider.
- Raise awareness and interest in SBC's DSL service to drive sales.

Strategies:

- Build and maintain a steady continuum of communications about SBC's DSL progress and accomplishments.
- Use state-of-the-art Internet technologies as vehicles to communicate SBC's messages.
- Establish SBC's leadership credentials by taking every opportunity to update reporters and analysts on SBC's DSL progress, and by seizing the agenda on coverage comparing DSL and cable modem service.
- Arrange for reporters to experience firsthand the benefits of DSL technology.

Execution

Market Launches:

- **Pre-Launch Media Briefings:** Top SBC executives met with key regional print reporters the day before launch events in metro markets to provide an in-depth briefing on SBC's DSL service.
- **Launch Event/DSL Demo:** DSL demos were held to illustrate the benefits of DSL technology. Demos featured side-by-side comparisons of DSL and traditional analog modems. Reporters were handed stopwatches to time speed differences, and projection systems were used to provide visual backdrops for camera crews.

Ongoing Media Relations:

- **Technology Test Drives:** To provide reporters with extensive, firsthand experience with DSL service, SBC implemented a "technology test drive" program.

<http://www.cnn.com/TECH/computing/9911/02/sbc.dsl.idg/>

Reporters received complimentary service for up to three months and were urged to write about their experience.

- **Reporter Field Visits/TRI Briefings:** Reporters were invited to ride along with technicians, and toured SBC's facilities, including the technology development center in Texas, and received briefings from executives.
- **Announcements:** Announcements included expanded deployment/price reductions; major telecommuting contracts with IBM, PeopleSoft and E*TRADE; a partnership with AOL; a Prodigy alliance; an online promotion with Intel; IBM/SBC one-stop-shopping solutions; and SBC's 100,000 DSL subscriber milestone.
- **DSL Update:** A two-page *DSL Update* was periodically sent to reporters, industry analysts and employees.

Project Pronto Launch:

In October, SBC announced its massive, \$6 billion Project Pronto initiative.

- **Industry Analysts Pre-Briefings:** Pre-briefed top industry analysts who later provided favorable commentary and perspective to media on the significance and magnitude of Project Pronto to SBC and the broadband wars.
- **Financial Analysts Conference:** Held half-day conference to brief financial analysts and institutional investors.
- **Media Outreach:** Announced initiative nationally and held satellite and radio media tours. Tailored media materials - maps, b-roll, fact sheets, graphics - by region and held events in local markets. Further credibility was gained by involving technology partners such as IBM, E*TRADE and Yahoo! in the announcement.
- **Web site/Webcast:** Extensive media and analyst Project Pronto Web sites featured a Web cast with executives and media materials such as news releases, fact sheets, graphics, photographs and maps showing service availability. SBC employees had access to a complementary internal intranet site.

Evaluation

The program significantly enhanced SBC's broadband reputation and helped produce a substantial increase in sales.

- SBC entered 1999 with 3,000 DSL subscribers and finished with 169,000, the most in the industry. SBC is projected to reach one million DSL subscribers by year-end 2000, another industry milestone.
- With minimal advertising, customer inquiries rose from 700 per day in January to 8,000 per day by year-end.
- The campaign generated more than 1,000 stories, including multiple hits in papers such as *The Wall Street Journal*, *USA Today*, *The New York Times*, *The Dallas Morning News* and *San Jose Mercury News*.
- Four announcements each generated more than 100 placements, with 300 hits for Project Pronto alone.
- About 950 reporters visited the Pronto media Web site and 130 financial analysts visited the investor Web site.
- In total, 66 reporters test-drove SBC's DSL service, resulting in 87 stories. Firsthand accounts appeared in publications such as *Fortune*, *The New York Times*, the *Los Angeles Times* and the *Houston Chronicle*.
- Leading analyst firms such as IDC, Gartner Group, Cahners In-Stat and Telechoice are now predicting DSL will overtake cable modems in two to three years.
- A recent survey by Decision Analysts, a research firm, found that the combined market share for Los Angeles, San Francisco, Houston, Dallas and San Antonio is 53 percent for DSL and 47 percent for cable modems.
- Around 340 financial analysts participated in the Project Pronto conference and left convinced SBC could seize the opportunity. "Absolutely correct in terms of strategy and timing," said Tim Horan, CIBC World Markets.

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DSL ON BOARD

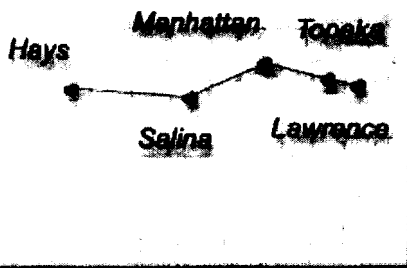
 **Southwestern Bell**
Business Partner

ADSL - Availability

"Near Ubiquitous" access slated for all 5 cities in Kansas' 785 LATA!

The Kansas Corporation Commission recently approved the deployment of ADSL in all 5 Kansas Cities in the 785 LATA (area code). All 5 cities were also chosen for what Southwestern Bell terms "Near Ubiquitous" access. This means that although access in your city might not reach your house or business in the initial deployment, Southwestern Bell intends to install additional ADSL

equipment in locations outside of the Central Offices (CO), extending the somewhat limited reach of DSL. Within 2 years, DSL should be available within the entire local calling area of each city.



Areas of concern are Southwest Topeka - Sherwood, East Lawrence, and Manhattan's West side where there are large concentrations of businesses and residents that have expressed an interest in ADSL service. If you want ADSL in your area, fill out a Loop Qualification Request below. Much like a petition, more requests mean more interest and potential customers. Southwestern Bell provisions equipment based on your interest! When new equipment is deployed that could affect your qualification status, we'll re-check your line and notify you when your availability status changes.

Timeline

In Topeka, ADSL circuits are being installed in homes and businesses today. Manhattan and Lawrence are officially able to place orders beginning **February 1, 2000**, and Hays and Salina will follow soon after. As an exclusive Southwestern Bell On Board ADSL Business Partner, you can count on Viewpoint Technologies to be ahead of the game when it comes to implementing broadband Internet access.

Local Loop Qualification

Local availability of ADSL in a given area is determined by so-called *local loop* considerations. Because of the demanding characteristics of this new high-speed communication medium, some locations will not be able to qualify for ADSL service even though they are served by an ADSL-capable, Southwestern Bell CO (central office).

The only truly reliable way of determining ADSL availability at your particular location is to have what's called a *local loop qualification* performed on your phone line. For those cities where ADSL has already been rolled out, Viewpoint Technologies can do this for you without obligation, and free of charge - the whole process usually takes less than a day. Simply fill out the form provided below, and we'll contact you, either by phone or e-mail, when the results are in.

In cities where ADSL has been announced but not yet rolled out, feel free to send us the necessary information (using the form provided below) - we'll be happy to do your loop qualification the moment it becomes possible to do so. Once again, there is absolutely no obligation.

Project Pronto

In October, SBC (the parent company of Southwestern Bell) announced Project Pronto, a \$6 billion further overhaul of its network that will (among other things) quadruple ADSL bandwidth while keeping prices steady, and extend the reach of ADSL to provide 'near ubiquitous' coverage in most cities where it is offered.

What this means for current ADSL customers is obvious - more bandwidth bang for the buck! What it means for everyone else in ADSL-capable cities is that even if your phone line didn't qualify the first time around, chances are it will before long.

Loop Qualification Request

To see if ADSL is available at your location, simply fill out this form and press the submit button. There's no obligation to subscribe, all information is confidential, and will only be used to determine your eligibility for ADSL service. You will be notified by e-mail or telephone (let us know in the 'Comments' section if you have a preference) when the results are in.

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NewsNow Story November 4, 1999

SBC lassos suppliers

*Vendors chosen for Project Pronto***ELIZABETH STARR MILLER**

SBC Communications has selected the initial suppliers for Project Pronto, its \$6 billion next generation network. The list includes six primary suppliers: Advanced Fibre Communications, Alcatel, Lucent Technologies, Newbridge Networks, Nortel Networks and Siecor.

"We have a set of suppliers who share our vision for making our next generation network a reality," said a spokesman for SBC.

Using equipment from the six suppliers, SBC plans offer broadband services to 80% of its customers over the next three years. To deliver the broadband services, SBC will implement voice-trunking-over-ATM technologies to converge voice and data backbone systems on a packet-switched platform.

AFC will supply digital loop carrier equipment along with Alcatel, who also will provide asymmetrical DSL equipment. Lucent will supply its 7R/E packet solution for voice-trunking over ATM along with fiber for the Project Pronto network. Nortel Networks and Newbridge also will provide voice-trunking-over-ATM solutions, and Siecor will provide fiber.

"We wanted to let people know that we are working with industry leaders," said the SBC spokesman, adding that SBC has worked with all the suppliers in the past.

SBC will be deploying the 7R/E packet solution in Los Angeles, a city known for its large amount of data traffic, said Diane Herr, vice president of 7R/E product management and marketing for Lucent. "The 7R/E is a high-capacity, reliable system that can handle the traffic demand," Herr said.

Lucent developed the 7R/E to address the needs of customers such as SBC, who need to move from a circuit-switched world to a packet-switched world, Herr said.

Although Nortel was not prepared to disclose the details of its equipment, Pete Koonce, senior manager of Internet telephony marketing for Nortel said, "We have products that will align with SBC's goals for a packet-switched platform." Nortel's part in Project Pronto was significant because it reaffirmed their long-standing relationship with SBC, he added.

With Project Pronto, SBC plans to move fiber and DSL equipment deeper into neighborhoods to deliver an efficient and integrated voice, video and data backbone network. "This is just one step we're taking to build Project Pronto," the SBC spokesman said.

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Okay, we've deployed it. Now what?

By Annie Lindstrom

As this special DSL supplement goes to press, SBC Communications (www.sbc.com) has announced its intent to spend \$6 billion deploying DSL to the masses in its 13-state territory. And we mean masses. The regional Bell operating company (RBOC) is launching Project Pronto, which will bring the service to within 12 kilofeet (kft.) of 77 million potential customers over the next three years.

What's encouraging is that SBC seems to recognize the problems as well as the opportunities of DSL. The carrier plans to overhaul its operations support systems (OSSs) so it can provision service and care for customers once it has attracted them with its Project Pronto marketing campaign.

SBC also plans to address the non-access side of the equation by beefing up its backbone with 12,000 miles of fiber and bandwidth-efficient asynchronous transfer mode (ATM) switches. The carrier says it will extend the network's reach by installing thousands of next-generation digital loop carriers (DLCs) to ensure that customers can be guaranteed consistent-quality DSL.

The carrier has secured anchor tenants in IBM Corp. and PeopleSoft, both of which will use the service for telecommuting applications. SBC is concentrating on delivering other money-making apps such as stock trading, entertainment-quality video, voice over DSL (VoDSL), personal videoconferencing, interactive online games and home networking.

Project Pronto makes it clear that DSL is picking up speed. Much more mature than it was just a year ago, demand for DSL is rampant and awareness of the acronym is high.

Unfortunately, potential customers are woefully uneducated about the service and DSL providers don't want, nor can they afford, to slow down long enough to spell out the details. DSL providers are overwhelmed by what they have gotten themselves into. And the CLECs aren't doing much better than the ILECs did with ISDN, as far as installation time frames and cost of the process goes.

This special supplement on DSL examines the issues that most important to its success — what's standing in the way, what's making the future look very bright.

- Our story on VoDSL says the 'killer app' is expected to bring in \$1 billion in new revenues next year.
- Billing and provisioning issues that can inhibit any good business plan are discussed.
- "Cozying up on Copper" looks at the regulators' plans to order incumbent local exchange carriers to share their copper loops with competitors.
- G.lite is ready for deployment, but is it too little, too late? We look at the pros and cons of deploying a service that only delivers 1.5 Mbps downstream.
- DSL providers that believed all they needed was a DSL access mux to go into business had better take a look at "No DSLAM is an Island."
- We examine emerging applications that will require more bandwidth (and more thought) on the part of carriers that want to deliver up new services to the bandwidth junkies.
- Finally, as competition makes consumers only more confused, we profile some Web-based DSL matchmakers who've taken the drudgery out of finding a service provider.

Grab a cup of coffee pull over to the side of the road. What we have to say will go a long way toward propelling you successfully into the new year.

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Efficient Networks: DSL Modem Giant Could Have Ironic Name

by [Chris Connor](#)

Leader in CPE Equipment

While Globespan {GSPN} leads in DSL chipsets, Copper Mountain {CMTN} leads in business DSL, and Turnstone {TSTN} is preeminent in DSL equipment management, Efficient Networks {EFNT} holds a commanding lead of the market for DSL equipment at the customer's premises. According to the Dell'Oro Group, Efficient Networks shipped over 290,000 units of this equipment in the first quarter of 2000, which puts it firmly in the lead. DSL customer premises equipment (CPE) consists of modems, Ethernet-attached bridges and routers. Let's distinguish between the different types of equipment. A household with only one PC would need only a DSL modem to get DSL access, while a household with two or more PCs would need a router to connect them to DSL. Businesses require only Ethernet-attached bridges and routers.

Customers Clearing the Way for Success

One of the primary reasons for Efficient's leadership in CPE is that its largest customer is the nation's leading provider of DSL access, SBC Communications. SBC's status as Efficient's number one customer could be even more important for Efficient going forward because of SBC's Project Pronto. Project Pronto aims to make SBC the largest single broadband provider in the U.S.; SBC is spending \$6 billion to be able to provide DSL access to roughly 80 percent of its wire-line customers (about 77 million people). As part of Project Pronto, SBC made the largest purchase, ever, of Efficient's DSL equipment to date on May 3rd, with purchase orders totaling over \$45 million. This transaction is of immense significance for Efficient, considering that the company generated only \$108 million in revenues in its last for quarters.

Dramatic Sales Growth

Despite the fact that Efficient has yet to make a profit after reporting results for eleven quarters (or 2 3/4 years), the company's revenues have clearly accelerated at a dramatic pace. In fact, Efficient has generated five straight quarters of sequential growth at an average of 103.6 percent per quarter. Believe it or not, the company's revenue growth has been even more impressive on an annual basis. For the last seven quarters, annual revenue growth has been 73.7 percent, 122 percent, 244.6 percent, 244.6 percent, 1053 percent, 937 percent, 1328 percent, and 1401 percent, respectively, beginning with the first quarter of Efficient's fiscal 1999 and ending with the third quarter of the company's fiscal 2000. It is not a common event for a company to report annual revenue growth over 1000 percent, but Efficient has achieved that considerable feat three times in a one-year period.

Risks

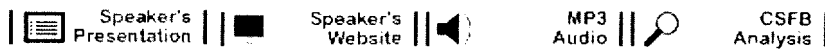
This degree of explosive revenue growth comes, however, at a high price in Efficient's case. The company is miles away from earning a profit because of two key factors: amortization costs generated by its December 17, 1999 merger with FlowPoint (a maker of DSL routers), which Efficient purchased from Cabletron {CS}, and horrible gross margins because the company's cost of revenues are skyrocketing just as fast as the company's revenues. For the quarter ended March 31, 2000, cost of revenues increased a whopping 1,072 percent to \$49.1 million on revenues of only \$61 million. That leaves a pitiful gross margin of only about 20 percent. The average gross margin in the communication equipment industry is 45.36 percent. (Efficient doesn't look too efficient in this respect.) Efficient's gross margins trail those of its industry so distantly because the company is pushing to get its products to market as soon as possible. By rushing to get its products to market as soon as possible the company hurts its gross margins because it offers initial price discounts for key customers and it is incurring expenses in such areas as manufacturing start-up and expediting charges.

Regarding the acquisition of FlowPoint, Efficient is stuck with quite a large amortization bill that will significantly impair the company's earnings for the foreseeable future. According to the company's latest 10 Q, "In connection with the FlowPoint acquisition, the Company (Efficient) recorded \$925.1 million in intangible assets, of which \$46.4 million and \$53.7 million was amortized in the three and nine months ended March 31, 2000. The remainder will be amortized at the rate of approximately \$46.3 million per quarter over a five year period." This \$46.3 million per quarter does not affect cash, but it is a non-cash charge that is taken out of net income. In the context of this situation, Efficient is going to have to at least double or triple its revenues from its last quarter if it wants to get even close to earning a profit. Furthermore, the company has fallen short of earnings estimates for all three quarters since going public.

Bottom Line

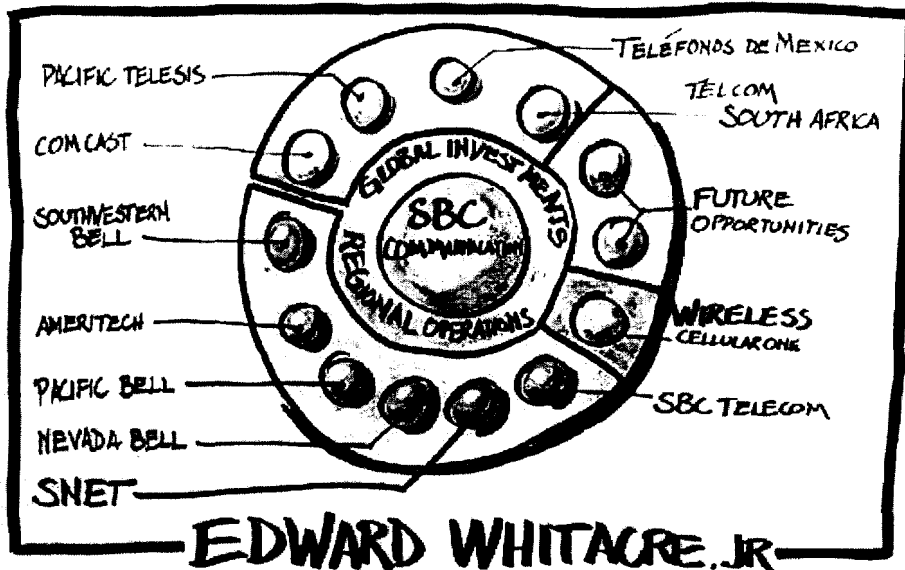
At first glance, Efficient appears to be an attractive way to participate in the rapidly growing DSL industry because the company's stock price is the farthest away from its 52-week high among all the DSL leaders, and it owns the technology for both its hardware and software. Additionally, EFNT should benefit tremendously for SBC's aggressive DSL deployment plans; the company has also already generated blockbuster revenue growth. Investors should, however, be extremely concerned about the company's lack of profit potential going forward. In the short term, the company's stock shows upside potential as SBC's plans continue to take effect, which will continue to provide a big boost to Efficient's revenues. Over the long-term, however, the company's future depends on its becoming a high volume provider of DSL modems and routers in order to make up for its low gross margins and huge quarterly amortization bill. For that to happen, the DSL industry will have to fulfill its promise of being a mainstream source of broadband access. If DSL remains a niche source of broadband access (albeit a rapidly growing one), Efficient will not likely earn a profit over the next five years.

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Summary: SBC Communications, Inc.

Edward E. Whitacre Jr., Chairman and CEO



Biography



Edward E. Whitacre Jr., 57, is chairman and chief executive officer of SBC Communications Inc., a world leader in providing a wide range of data and voice communications services. SBC provides innovative products and services through subsidiaries acting under the Ameritech, Southwestern Bell, Pacific Bell, Nevada Bell, Southern New England Telecommunications (SNET), SBC Telecom, and Cellular One brands.

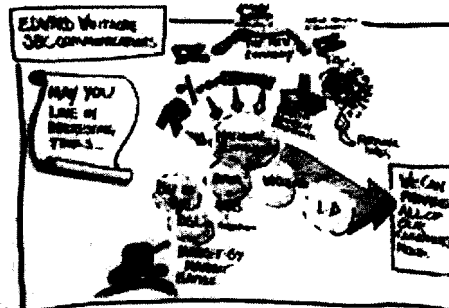
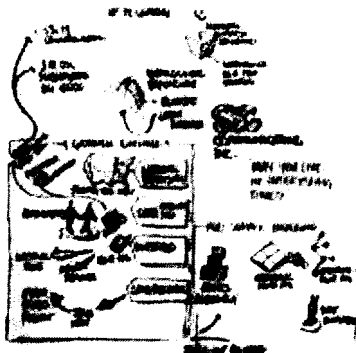
During Whitacre's tenure, San Antonio, Texas-based SBC has differentiated itself from the pack of former regional Bell operating companies through diversification, a disciplined growth strategy and strategic mergers and acquisitions.

Whitacre has led SBC in an era of unprecedented growth for the company, including major expansion into the wireless communications business and major investments in Telefonos de Mexico, Telkom South Africa, and the acquisitions of Pacific Telesis (1997), SNET (1998), Comcast (1999) and Ameritech (1999). SBC has a market value of nearly \$174 billion (Sept. 30, 1999), revenues of \$46 billion (1998) and earnings of \$6.7 billion (1998). The company has more than 203,000 employees, serves 24 states and the District of Columbia, and has a telecommunications presence in 22 countries, and Puerto Rico and the U.S. Virgin Islands.

Whitacre began his career with Southwestern Bell Telephone Company in 1963 and held a variety of positions within the company's operating region. He was appointed an officer in 1982. In 1985, he moved to the company's headquarters where he served as group president, vice president-revenues and public affairs, and vice chairman and chief financial officer. In 1988, Whitacre was appointed chief operating officer. He was named chairman and CEO in 1990.

Under his leadership, for the third consecutive year, SBC has been named the world's most admired telecommunications company by Fortune magazine. The company also is regularly cited for outstanding diversification of its work force and was most recently cited as one of the 10 best places to work for minorities.

A native of Texas, Whitacre graduated from Texas Tech University in 1964 with a bachelor's degree in industrial engineering. Whitacre serves on the boards of Anheuser-Busch Cos., Burlington Northern Santa Fe Corp., Emerson Electric Co., and The May Department Stores Co. He is the national president of the Boy Scouts of America and is the immediate past chairman of the Board of Regents of Texas Tech University and Texas Tech University Health Sciences Center. He also is on the board of the Institute for International Economics, and is a member of The Business Council. In 1998, Whitacre was named one of the Top 25 Executives of the Year by *Business Week*.



Mission and Goals

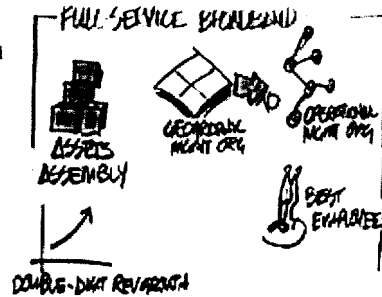
Over the past several years we have executed our plan to turn our company into a full-service broadband competitor. We have assembled the assets we need and integrated them into a streamline operation. We've gone from a management structure based on geography to one based on functions and operations. We've done that quickly and efficiently. All of this has allowed us to prepare for opportunities and accelerated growth.

Strategy

Here are the forward looking engines that make the most of our assets, and will account for 75% of our revenue growth for the next three years: national expansion, data, wireless, and long distance.

Expand the National Wireline and Wireless Footprint

We are now a wireline and wireless powerhouse from Mexico through Canada. We are filling the rest of that map by expanding into thirty new markets throughout the nation. That puts us in each of the fifty largest markets in the United States. We'll cut one year out of that expansion plan. We'll be in those markets by October, 2001. By 2002, that presence will generate us \$1.1 billion. There has been a tendency to view our national and local initiative as a regulatory strategy to gain approval for our Ameritech acquisition. That's not true. The national/local initiative was our idea all along and we wanted to do it. The expanded geographical reach is critical for large business accounts. Our 424 largest customers spend \$2.2 billion with us but that's only 10% of their telecommunications spending.



Deliver Data and Internet Capabilities

We also plan to deliver data. We have an outstanding portfolio of data and Internet assets. We've announced acquisitions or partnerships with companies like Sterling, which gives us a leg up on the business to business sector. Infonet gives us global data capabilities. The deals we did make a lot of sense financially.

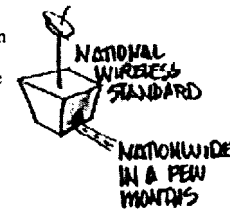
We'll reach all of our consumer customers with DSL 1.5 megabit service through project Pronto. Sixty percent will have access at speeds of 6Mbps. We are ahead of schedule in reaching the market with DSL. We will be at 18 million customers-capable by the end of the year. We're very optimistic about DSL's prospects. It's more secure, reliable and consistent speedwise than cable. Customers prefer to receive Internet access via phone lines by a 3:1 or 4:1 margin. This is not an industry vs industry war. It's being fought company to company in each market. Under project Pronto we will be the nation's leading provider and deployer of DSL service. Project Pronto is a lot more than a huge DSL rollout. It's a fundamental reconfiguration of our network that pushes fiber into the networks, reduces capital, reduces maintenance and allows a host of services beyond DSL.

The point is, SBC does "get it" when it comes to the digital economy. Data is a \$6 billion revenue stream growing at 30% annually. It's only going to get better. We are committed to broadband and DSL. Data will soon be at the heart of what we do and no one will do it better. We understand the customer's data needs and are solving those needs.



Expand Wireless Footprint and Subscriptions

We also get it when it comes to wireless. We cover more than 120 million POPs and serve more than 11 million customers. We're in 150 market areas. It will grow more than 15% annually. We have very strong momentum from last year. We added 458,000 subscribers in the fourth quarter and there are big upside opportunities for us in wireless. We're moving to establish a larger footprint for our wireless operations and we're going to be active in the wireless data space with respect to information services and messaging.



Add Long Distance Capability

We expect to be in long distance soon in Texas and the rest of the states will follow shortly. The application we submitted is the strongest the FCC has ever received. Once we're in, long distance will allow us to double our \$3 billion in revenues over the next 3 years. We're making progress in the Ameritech states, too. We've also talked with regulators about conducting region wide operational support system tests. That will accelerate our progress.

Results

We finished 1999 very strong with 12.5% earnings growth for the year and \$7.4 billion. We've added scale and scope. We have 60 million access lines and unparalleled North American reach. We have long distance networks through project Pronto and Williams Communications. We have world class data and Internet capabilities through alliances with Infonet and others. We acquired Sterling Commerce and Prodigy. We have holdings in 14 countries in Europe. We're the biggest non-European investors in Europe. We're in 22 countries globally. We have total International assets valued at \$30 billion and invest \$11 billion. We have the best employees in the business. We're the only communications company that our customers will ever need. And we have a company that can grow.

By 2001, we will deliver double digit revenue growth and mid-teens earnings growth. The four growth engines contribute 1/3 of our \$50B in revenues. In 3 years they'll contribute more than * of our revenues.

SBC maps superfast access plans

Most of Houston to see ADSL upgrade by 2002

By DWIGHT SILVERMAN
Copyright 1999 Houston Chronicle

SBC Communications' \$6 billion network upgrade will ensure nearly all of its Houston-area customers will be able to get a super-fast connection to the Internet.

Houston is a priority city for Project Pronto, as the San Antonio-based telecommunications giant is calling the initiative. The upgrade will eliminate the distance limitations associated with ADSL, or Asymmetric Digital Subscriber Lines by moving network equipment out of the central offices into neighborhoods by 2002.

Currently, customers who are too far from a central office can't get the service, which provides Internet connections far faster than a standard computer modem.

And, SBC executives say that customers who currently have ADSL will find that it will get faster.

SBC is the parent company of Southwestern Bell. The company also owns Pacific Bell, Nevada Bell, SNET in Connecticut and Ameritech, the acquisition of which was completed this month for \$74 billion.

The effort also will modernize SBC's network, better enabling it to offer advanced services in the future, including voice calls transmitted via the Internet.

ADSL currently lags behind its primary competition for high-speed Internet access in the home - cable-modem service from cable television providers.

Jupiter Communications, a New York-based market research company, estimates there were 700,000 cable modems in service in the United States in August, compared with 160,000 ADSL households, and 40,000 to 50,000 businesses with ADSL.

Not every customer in SBC's 13-state region will get this fast service as a result of this project. The plan calls for 80 percent of the 77 million customers to have access to ADSL by 2002.

Jeanne Schaaf, a senior analyst with Forrester Research in Cambridge, Mass., and other analysts said it is the most aggressive upgrade of an existing phone network announced by any of the so-called Baby Bells.

"In our perspective, this is not just about an ADSL rollout," said Schaaf. "This is about re-architecting the telephone network for the Internet economy."

SBC's stock closed Monday at 48 7/16, down 1/4.

Southwestern Bell rolled out ADSL under the brand name FasTrak DSL in Houston this year. It offers the service at two levels.

Residential customers can pay \$39 a month and expect connection speeds between 384 kilobits and 1.5 megabits a second, while businesses can pay \$129 a month for speeds between 1.5 and 6 megabits a second.

That price does not include Internet service, just the high-speed line. However, Southwestern Bell Internet Services and other providers typically charge about \$10 more for access bundled with ADSL.

But only about 70 percent of Southwestern Bell's Houston-area customers currently can get this fast service. The farther a customer is from a central office where ADSL equipment is installed, the slower the service performs. Generally, Southwestern Bell won't activate ADSL if the customer is more than 17,000 feet - about three miles - from the central office.

Other factors can prevent a customer from getting ADSL even if distance isn't a factor. For example, devices on a neighborhood's network designed to improve voice quality can interfere with it.

SBC plans to address these limitations by moving its ADSL equipment into neighborhoods and office parks. Components that were once housed in buildings have been reduced to the size of an add-in card for a computer, and can be plugged into cabinets and huts that serve specific areas.

Eventually, all its customers will be within about 12,000 feet from ADSL equipment, company executives said.

SBC also will increase the amount of fiber-optic cable in the field. Fiber, which carries digital signals via light, is capable of much higher speeds and can carry much more information than copper cable. Adding more fiber to the system will speed the network.

Once Project Pronto is completed, residential customers will be able to expect a minimum of 1.5 megabits, while business customers will get at least 6 megabits. SBC officials said there would be no change in price.

"Our business plan contemplates a downward trend in pricing," said Dave Gallemore, executive vice president of strategic marketing and planning for SBC, during a conference call with reporters. "I don't believe it gets down to \$20 a month, but we filed a tariff with the (Federal Communications Commission) that makes DSL available from \$30 to \$39 a month. There's already that range in the marketplace."

Kevin Long, senior technologist for Southwestern Bell Telephone, said his company serves 60 percent of Houston-area phone customers and nearly all central offices are capable of offering ADSL to customers. The other 40 percent are served by phone companies other than Southwestern Bell, including GTE, Sprint and TXU Communications.

"And right now, about 70 percent of (our customers) can get it," Long said. After Project Pronto is complete, everyone in Bell's local service should be able to get ADSL if they want it.

Long would not say how many people in Houston have ADSL currently, but SBC executives said during Monday's conference call that 100,000 customers have it throughout its entire service area.

In Houston, Bell's cable-modem competitor is Time Warner Communications's RoadRunner service. Time Warner launched RoadRunner this summer.

Time Warner now manages the cable TV systems for most of Houston, having taken over management duties for that part of the city once handled by TCI. Only the original Time Warner region - roughly the western half of Houston - can get RoadRunner. Customers in the TCI area won't be able to get it until sometime next year.

Executives from Time Warner did not return phone and e-mail requests for comment Monday.

Joe Laszlo, an analyst with Jupiter, said he didn't think SBC's timetable was particularly aggressive, "but what's interesting is that they are committing themselves to a timetable at all."

"There is the idea that broadband should be available to everyone, and certainly with this announcement, they are embracing that idea," he said.

SBC executives also said that some of the network upgrades will fix some problems experienced by users of traditional, dial-up modems.

Many computer modems that are rated at speeds of up to 56 kilobits a second seldom make connections anywhere near that rate. It's not uncommon for a 56K modem to connect at 28.8 kilobits or less.

That can happen for a variety of reasons, ranging from poor in-house wiring to switching between copper and fiber-optic cable between the user and that person's Internet provider.

Increasing the amount of fiber-optic cable that goes into the neighborhoods should improve dial-up connections as a result, SBC's Gallemore said.